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(54) Title: THERMAL INSULATION STRUCTURES COMPRISING LAYERS OF EXPANDED GRAPHITE PARTICLES COMPRESSED TO DIFFERENT DENSITIES AND THERMAL INSULATION ELEMENTS MADE FROM THESE STRUCTURES

(57) Abstract: Thermal insulation structure comprising at least one flexible layer based on compressed expanded graphite particles characterised in that the density of the said flexible layer is equal to at least 0.4 g/cm³ (400 kg/m³) and in that the said thermal insulation structure also comprises another layer close to the said flexible layer based on compressed graphite particles with a lower density, typically less than 0.4 g/cm³ (400 kg/m³). Preferably, the dense compressed expanded graphite layer has a density of between 0.5 and 1.6 g/cm³ (500 and 1600 kg/m³) and the said sub-dense compressed expanded graphite layer has a density of between 0.05 and 0.3 g/cm³ (50 and 300 kg/m³). Thermal insulation elements are also described that are designed to be fitted on furnaces operating under non-oxidising atmosphere and at temperatures of more than 800°C.

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INTERNATIONAL SEARCH REPORT

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PCT/EP2004/001017

A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C04B B32B F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/182387 A1 (GETZ MATTHEW GEORGE ET AL) 5 December 2002 (2002-12-05) paragraphs '0043!', '0044!; claim 1; figures 1,2; example 1	1,3-8,12
X	US 5 573.253 A (NAITOU KAZUMASA ET AL) 12 November 1996 (1996-11-12) column 4, line 48 - column 5, line 11	1,5,8
X	EP 0 263 402 A (FELT PRODUCTS MFG CO) 13 April 1988 (1988-04-13) column 1, line 30 - column 2, line 18 column 3, lines 40-49	1
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 404 061 A (BOCHMAN RAYMOND A ET AL) 1 October 1968 (1968-10-01) cited in the application column 13, line 7 - column 14, line 14 column 15, lines 1-24	1-18
A	WO 01/78460 A (MERCURI ROBERT ANGELO ;PAVLISIN JAMES JOSEPH (US); GRAPHTECH INC () 18 October 2001 (2001-10-18) page 3, line 13 - page 4, line 14; figure 2 page 7, line 27 - page 8, line 9; claim 1	1-18
A	EP 0 433 478 A (SIGRI GMBH) 26 June 1991 (1991-06-26) page 1, lines 11-13 page 5, lines 17-37	1-15
A	US 5 509 993 A (HIRSCHVOGEL ALFRED) 23 April 1996 (1996-04-23) column 6, lines 40-67; example 5	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/001017

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2002182387	A1	05-12-2002	EP 1423271 A1 WO 02096638 A1 US 2003067733 A1	02-06-2004 05-12-2002 10-04-2003
US 5573253	A	12-11-1996	JP 2769523 B2 JP 7217745 A AU 676294 B2 AU 6463894 A CA 2125552 A1 CN 1120139 A , B DE 69422792 D1 DE 69422792 T2 EP 0665393 A1 ES 2142377 T3 KR 222376 B1 NZ 260702 A US 5522603 A	25-06-1998 15-08-1995 06-03-1997 10-08-1995 01-08-1995 10-04-1996 02-03-2000 21-06-2000 02-08-1995 16-04-2000 01-10-1999 27-06-1995 04-06-1996
EP 0263402	A	13-04-1988	US 4705278 A DE 3771635 D1 EP 0263402 A2 JP 4078869 B JP 63092873 A	10-11-1987 29-08-1991 13-04-1988 14-12-1992 23-04-1988
US 3404061	A	01-10-1968	DE 1253130 B FR 1395964 A GB 1049588 A GB 991581 A US 3494382 A	26-10-1967 16-04-1965 30-11-1966 12-05-1965 10-02-1970
WO 0178460	A	18-10-2001	WO 0178460 A1 AU 4080900 A BR 0017204 A EP 1279319 A1	18-10-2001 23-10-2001 14-01-2003 29-01-2003
EP 0433478	A	26-06-1991	DE 8914883 U1 EP 0433478 A1	15-03-1990 26-06-1991
US 5509993	A	23-04-1996	DE 4309700 A1 DE 59400712 D1 EP 0616884 A2 JP 2905786 B2 JP 6321518 A	29-09-1994 31-10-1996 28-09-1994 14-06-1999 22-11-1994